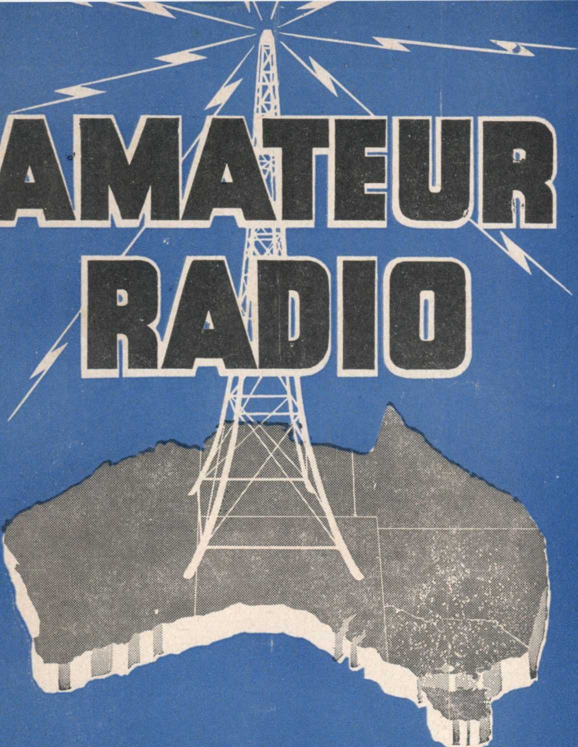
AMATEUR RADIO



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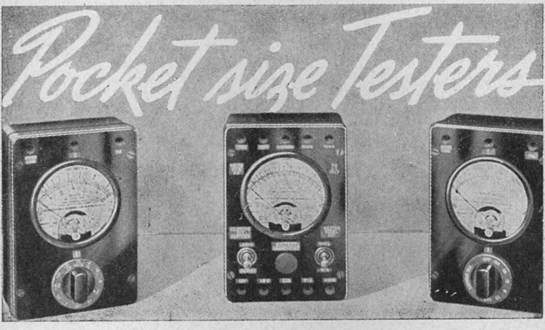

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EDITORIAL

It has been revealed that short wave transmissions have been carried out by some misguided individuals on Amateur Bands. In times of Peace, the Wireless Institute has often championed the cause of those unfortunates who have overstepped the mark either through ignorance or over enthusiasm. But in time of War we offer no sympathy to those who are foolish enough to break the law in such flagrant fashion. No excuse can be accepted for this behaviour, and every right thinking Amateur feels a justifiable indignation that such persons should endanger the spirit of goodwill that has always existed between the Australian Amateur and the Powers that be. Such a selfish and irresponsible attitude has considerably upset any chances the Australian Amateur may have possessed with regard to the restitution of our experimental licences, and it is the duty of all real amateurs to cooperate with the Authorities in suppressing any further illicit transmissions. We can hardly expect the penalty to be slight, and we don't mind saying that we hope it won't.

. . This month we are presenting a combined issue of the March and April efforts of technical and notes contributions. It represents an issue as unique in the annals of Amateur Radio as our "1636" issue; in that the latter was a typographical error, and the former forgetfulness—on the part of our contributors. However, in all seriousness, we are not anxious to curtail the regular publication of "Amateur Radio" to further bimonthly issues, which will not be necessary if we receive the continued support of our contributors in all States. One of the most surprising things to us has been the tendency for the Australian Amateur to drop his bundle under the present conditions. We were always of the opinion that the VK ham was able to meet any condition and to overcome any obstacle in an emergency, such as that exists to-day. It hardly seems possible that the hobby of radio can lack spheres of interest that would attract the attention of the true experimenter. "Amateur Radio" can only continue publication so long as support is forthcoming, such as that evidenced by the N.S.W. and Queensland Divisions, who respond to our urgent appeal for support so effectively.

We are attempting to institute a new section in this issue to attract the interest of the S.W.L., and we hope that our readers will contribute short wave notes and DX information to help make this innovation a complete success. The Editorial Committee is taking steps to secure the rights to re-publish overseas articles of outstanding interest, and we hope to make the magazine the chief link in binding the W.I.A. together during these uncertain times.

Putting The Vacuum Tube Voltmeter into Service

(Continued from February Issue).

Care should be used in selecting the vacuum tube voltmeter, to make sure that the device will function satisfactorily over a wide frequency range since the vacuum tube voltmeter will be used occasionally on d.c., occasionally on commercial frequencies, frequently in the audio range, and most often on radio frequency currents. With receivers now including the short wave bands, it is necessary that the vacuum tube voltmeter be able to handle frequencies of the order of 10 to 20 megacycles with negligible errors.

Care should be used in selecting the vacuum tube voltmeter to insure the selection of an instrument that has a minimum number of controls to operate for any given purpose . This statement is not intended to convey the idea that a vacuum tube voltmeter with a minimum number of controls would be the best, but rather that the number of controls that must be manipulated for any given reading or between any two successive readings, should be a minimum. The device must be provided with adequate controls for adjustment and the conversion of the circuit to take care of RMS, peak, and d.c. readings. Since the vacuum tube voltmeter contains radio tubes which will change from time to time it is essential that the circuit be equipped with adequate adjustments to maintain calibration in use.

Up to approximately 15 volts the vacuum tube voltmeter input circuit should be connected directly to the grid of the tube so as to make the input impedance of the device as high as possible, thus placing the least possible load on the circuit under test. For voltages above 15 volts the serviceman may provide himself with a voltage divider. If such a divider is used the resistance of the total divider should be appropriate for the circuit across which it is connected. Obviously, for high impedance circuits the voltage divider must have considerable resistance and for best results should contain a resistance equal to 10 to 20 times the impedance of the circuit across which it is connected. For low impedance circuits the resistance of the voltage divider can be proportionately lower. It should be noted that for practically all normal uses of a vacuum tube voltmeter the range .2 to 16 volts is ample. Only occasional requirements will be encountered for voltages in excess of 16 volts.

When using a voltage divider in conjunction with a vacuum tube voltmeter care must be taken to allow for the load introduced on the circuit by the voltage divider since the high impedance of the grid circuit of the vacuum tube voltmeter is no longer the determining factor.

When taking measurements on circuits where there is no returned path for the grid circuit of the vacuum tube voltmeter is is only necessary to return the grid through a suitable resistor and to connect the vacuum tube voltmeter to the circuit under test through a suitable blocking condenser. For most vacuum tube voltmeters, a three megohm resistor and a .00025 microfarad condenser will be found satisfactory for this application.

It should be noted that readings taken with the above combination on alternating currents, will be peak values and that to obtain the effective value of the reading a multiplying factor of .707 should be used. Since most vacuum tube voltmeter indications are used proportionately it is often unnecessary for the user of the device to reduce peak readings to effective value readings.

It should be noted that when taking measurements across grid circuits that are a.v.c. controlled, or where a d.c. grid voltage is introduced between the grid of the receiver tube and the ground, if direct measurements are to be made across this grid circuit, the bias voltage should be eliminated by grounding the a.v.c. lead in the receiver, or the d.c. blocking connector should be used with the vacuum tube voltmeter. The former method is preferred as the blocking connector does place a

slight load, i.e., approximately 3 megohms, across the circuit to be measured. If neither of these precautions are taken, the d.c. bias voltage will be read on the vacuum tube voltmeter causing extreme errors in reading.

The vacuum tube voltmeter should be so designed and built as to permit direct access to the grid terminal of the vacuum tube voltmeter tube so that for high frequency work the connecting circuit between the circuit under test an dthe vacuum tube voltmeter grid and its cathode, can be as short and free from loss as possible. This precaution becomes increasingly necessary as the frequency is increased over five megacycles.

One of the most important measurements that can be made on a superheterodyne receiver is that of oscillator performance. To make this measurement the vacuum tube voltmeter should be set on its highest range. Connections can then be made from the stationary plates of the oscillator tuning condenser to ground. For this connection it is recommended that the grid be connected to the stationary plate and the ground terminal to the chassis. See Figure 24.

With the receiver turned on, a reading should be obtained on this range, the usual potential of oscillator circuits running somewhere between 6 and 16 volts. There is no need to use any d.c. blocking condenser as the oscillator test circuit is always connected from the grid of the oscillator tube to ground.

It may be found that a better reading will be obtained on one of the lower voltage ranges, and if so, the switch should be turned to one of these ranges, either the receiver turned off or the lead disconnected from it, and the zero setting readjusted if necessary. The receiver can then again be turned on and with approximately a half scale reading the receiver dial should be rotated from one end of the band to the other. The oscillator voltage will vary to some extent but should in all cases maintain a potential of at least 60% of the highest value.

If the receiver is an all-wave type, it should be switched to each of the short-wave bands and operation of the oscillator tube on each of these bands noted. If there are any dead spots or points where the oscillator ceases to function they will be immediately apparent by sudden drops to zero of the instrument pointer. These conditions can then be rectified by inspection of the oscillator circuit, inspection of the tube electrodes and a test of the tube itself. The oscillator cathode biasing resistor and its associated by-pass condenser are often causes of trouble in this circuit.

These should be inspected carefully and if erratic operation is still apparent either the plate voltage on the oscillator should be increased or the bias resistance dropped in value approximately 10%. An open in the oscillator grid coupling condenser is often the cause of dead spots.

Measurements of gain per stage are of extreme value in all types of receivers as such measurements tell definitely how much work each tube with its associated circuit is doing. To make this measurement, an oscillator having a reasonably high output voltage and good attenuation characteristics should be connected to the antenna and ground posts of the receiver to be tested.

With the oscillator turned on and a signal tuned in, the meter can be connected directly across the grid circuit of the stage to be measured. If it is an r.f. or i.f. stage, the leads from the meter to the test circuit should be kept as short as possible, and preferably, the short voltmeter grid lead should be removed entirely.

The a.v.c. tube should be removed from the receiver or, if this is not possible, the a.v.c. lead should be grounded to the chassis. See Figure 25. If neither of these operations can be carried out, then the d.c. blocking connector should be used.

By turning the oscillator to its full output and tuning in the signal a reading should be obtained on the vacuum tube voltmeter. This reading should be noted and the meter connected to the grid of the following tube. The ratio of the two readings will be the gain across this particular stage. In making this measurement the circuit under test may be thrown slightly off resonance by the tube capacity placed across the circuit. The shunt trimmers for this circuit should be slightly readjusted to allow for the tube capacity if exact readings are required.

Each individual coil of the receiver may be checked for resonance with its tuning condenser by referring to the circuit of Figure 26. The vacuum tube voltmeter is connected directly across the grid circuit, and

the oscillator tuned to the required resonant frequency of the tuned circuit under test. The padder, trimmer or air dielectric condenser should be adjusted until a sharp resonant point is noted on the vacuum tube voltmeter scale. A definite peak indication should be obtained showing that the coil actually resonates and is not just passing energy from previous circuits, the resonant characteristic being proof that the coil and condenser are doing their job correctly.

While measurements are made across plate tuned circuits, care should be taken to protect the input of the vacuum tube voltmeter from the d.c. plate potential applied to the tube. The meter should be connected either directly across the plate coil

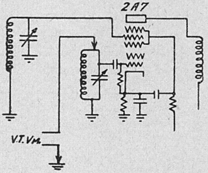


Figure 24.

or through the d.c. blocking connector to the chassis of the receiver. By using this same type of circuit the actual r.f. potential across any coil can be measured. When making either the adjustment for resonance or the measurement it may be found that a slight readjustment of the trimmer condenser will be required due to the tube capacity of the 78 tube being placed in parallel with the trimmer of the padder condenser. However, this correction can be made by moving the vacuum tube voltmeter on to the next stage and readjusting the trimmer of the first stage to give maximum reading across the second circuit.

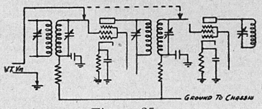


Figure 25.

The first requirement for making adjustments of this type is an r.f.

voltage of sufficient magnitude to give ample readings on the vacuum tube voltmeter. If the frequency of the trap circuit to be adjusted appears in the broadcast band, then a tuned r.f. receiver can be set up and turned on, with the oscillator connected to the antenna and ground terminals. By setting the oscillator control to the frequency required for the resonance of the trap circuit and tuning the receiver to this frequency, considerable voltage can be built up across the second or third receiver stage.

When adjusting the oscillator be sure to set the attenuator at the maximum position using the high output jack. A small coupling coil of 10 to 20 turns having the same

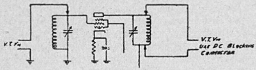


Figure 26.

diameter as that of one of the tuned r.f. coils can be wound up quickly and placed over the end of the receiver tuning coil. With the same number of turns on the other end of this coil circuit brought out at a convenient place on the bench or table, a field can be set up for adjusting the trap circuit. See Figure 27.

The coil and condenser forming the trap circuit should be connected directly across the input to the

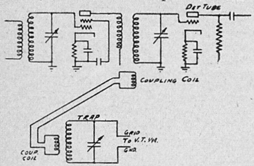
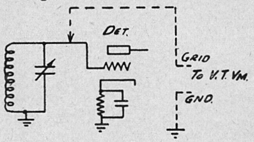


Figure 27.

vacuum tube voltmeter with the coil brought out from the receiver coupled closely to the trap circuit. The trap padder should be adjusted for maximum deflection on the vacuum tube voltmeter. If the trap is to be resonated with a fixed condenser, turns should be removed from the coil one at a time until a maximum reading is obtained.

If it is convenient to get at the coils in the tuned r.f. receiver, the trap circuit can be adjusted by placing it directly in the field of the receiver coil. To make sure that the efficiency of the trap circuit is good, the trap should be tested for continuity at other frequencies. To do this the trap should be connected as shown in Figure 28, in series with the test oscillator and with the receiver and oscillator tuned to a frequency other than that to which the trap is adjusted, a reading should be obtained on the vacuum tube voltmeter. If no reading or a very low reading is obtained, it is obvious that the trap circuit will not pass to a great extent, frequencies on each side of the resonant point. This can be corrected by using a smaller coil and a larger condenser.



Receiver Detector Circuit

Figure 28.

The degree of attenuation of the trap circuit on any frequency can be measured by taking a reading with the trap in series with the oscillator and then shorting out the trap circuit and noting the second reading.

If the trap circuit is to be designed for frequencies somewhere in the intermediate band then a superheterodyne receiver should be set up and the oscillator connected from the grid of the first detector tube to the chassis. The amplification obtained in the i.f. section of the receiver can then be used to build up the voltage as mentioned in the previous paragraphs.

It is quite often found advantageous to connect a trap circuit resonated to the intermediate frequency in series with the antenna connection in the superheterodyne receiver. Such an arrangement will cut down to a considerable extent the image ratio of the receiver or, in other words will limit feedback of the intermediate frequency potential into the antenna circuit.

Alignment and adjustment of a.v.c. receivers can be handled accurately and rapidly by making use of the

vacuum tube voltmeter as an a.v.c. voltmeter indicator. The ground connection should be made directly to the a.v.c. lead which carries voltage to the various r.f. and i.f. tubes with the grid of the vacuum tube voltmeter connected to the chassis of the receiver. With the test oscillator connected either to the first detector tube or to the antenna and and ground posts of the receiver, adjustments of the various trimmers can be made for maximum a.v.c. swing on the vacuum tube voltmeter.

If exact alignment is to be carried out by this method, the r.f. stages

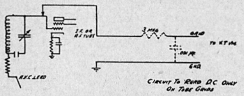


Figure 29.

should be aligned first. As an increase in signal at the input to the second detector tube will result in an increase in a.v.c. voltage, exact alignment of all the tuned circuits can be made without changing the position of the vacuum tube voltmeter.

On some receivers a.v.c. amplification is used. In such cases with the oscillator connected to the first detector tube and a signal tuned in, the trimmers that resonate the a.v.c. amplifier tube circuits should be adjusted for maximum a.v.c. voltage, this being indicated on the V.T.V. instrument. D.C. voltage readings can be taken directly with the vacuum tube voltmeter. The indications must be transferred to d.c. volts by reference to calibration curves supplied with the device. Line a.c. volts at all frequencies are most important, the instruments are calibrated in a.c. with d.c. curves supplied.

To make sure that the a.v.c. operation of the receiver is correct, the attenuator of the oscillator should be manipulated back and forth with a corresponding change in a.v.c. potential indicated by the meter. If correct action does not take place the resistors in the a.v.c. circuit of the diode detector should be examined, as the drop across these resistors determines the a.v.c. potential. If a separate a.v.c. amplifier tube is used, this tube and its associated circuit should be examined to make sure that it is functioning properly.

Occasionally the resistors connecting from the return circuits of the r.f. or i.f. coils to the a.v.c. control lead become open or the by-pass condensers in the grid return circuits become shorted. Either of these two difficulties will stop a.v.c. action on the tube grid. To make sure that this action is taking place directly on the grid of the tube, the circuit shown in Figure 29 should be used. The condenser across the input circuit of the vacuum tube voltmeter will short out the radio frequency at that point while the d.c. potential applied to the grid of the tube will be indicated by the meter.

Following out this same arrangement proportional a.v.c. action on each tube can be determined. On some receivers twice the a.v.c. voltage is applied to the i.f. and preselector circuits as is used on the converter tube. To note a.v.c. action, adjust instrument to read full scale on 1.2, 3, or 6 volt range. When voltmeter is connected to tube grid, deflection will be down scale.

Tests for gain per stage can be made quickly and accurately by making use of the V.T.V. The amplifier or audio section of the receiver

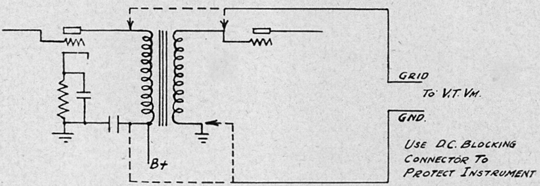


Figure 30

under test should be connected to an oscillator which will produce a constant audio output reading. The oscillator can then be turned up until a reading is obtained across the first audio transformer on the vacuum tube voltmeter as shown in Figure 30. By connecting the V.T.V. to the secondary of this same transformer the step-up ratio in voltage can be determined. The voltmeter can then be moved along the primary and secondary windings of the transformers in succeeding stages and readings taken giving the overall gain or gain per stage.

If gain per stage or overall gain measurements in decibels is required, the voltage ratio can be converted to decibels using any of the d.b. charts available. The readings may be taken directly by using any d.b. meters. It should be remembered when calculating the overall d.b. gain of an amplifier that the input and output impedances should be figured at the same level; in other words if an amplifier is equipped with a 500 ohm input and the output terminates in a speaker voice coil, the reading taken across the speaker voice coil should be referred back to the reading that would have been obtained were it a 500 ohm line. If this correction is not made, then care should be taken in stating the overall gain of the amplifier with reference to the two different output impedances.

If the gain of the amplifier is to be tested at some other frequency a beat frequency oscillator should be connected across the input and readings taken at other audio frequencies. If fidelity curves are wanted they can be taken by making use of the circuit shown in Figure 31, or for best results the rectifier voltmeter placed across the output of the beat frequency oscillator should be replaced by the vacuum tube voltmeter so as to permit the reading of the input and output voltages of the amplifier on the same device. In this connection it should be noted that the vacuum tube voltmeter has a flat frequency curve, the instrument being good to better than 3% for the frequency range 40 cycles through 50 megacycles. This flat frequency response curve of the vacuum tube voltmeter permits accurate fidelity curves to be taken.

The V.T.V. can be used to measure voltages across by-pass condensers at various frequencies determining the by-passing action of these condensers

in any circuit. When making such measurements, care should be taken to make sure that electrostatic pick-up to the grid lead of the voltmeter is not taking place. This can be avoided in extreme cases by using a short shielded lead to the grid or by keeping the other side of the voltmeter grounded.

Audio transformer ratios can be measured quickly and accurately by using the circuit in Figure 32. This figure shows the method of measuring impedance ratio and frequency response characteristic of a 200 ohm to grid audio transformer. It should be noted from the figure that 200 ohms appear across the input, whereas the transformer secondary is across the grid and and ground connections of the vacuum tube voltmeter. If the transformer under test is to work into a definite load, say 10,000 ohm carbon resistor should be connected across the secondary using the same type of circuit. If the correct loading resistors are not used, the frequency characteristic and impedance ratio of the transformer will not correspond at all with the actual conditions in the amplifier or the receiver.

It is often difficult to obtain continuity readings on condensers having capacities below 250 micro-micro-farads. These may be checked for continuity by connecting them in series with the condenser used in the d.c. blocking connector making connection to an audio frequency source of potential. If the condenser is O.K. a reading will be obtained on the vacuum tube voltmeter. If the condenser is open, no deflection will be obtained when the audio source of potential is turned off.

The voltmeter can be used in many other circuit measurements including the drop across chokes, resistances, r.f. coils and other such circuits. The only general precautions that are to be taken in these cases, is to make sure that no electrostatic pickup is appearing in the grid of the tube or in other words, the reading is determined only by the drop across the circuit component being measured.

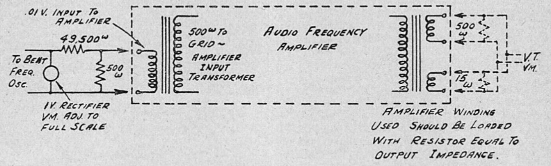


Figure 31

The vacuum tube voltmeter is limited only in its usefulness to the ability of the operator. Many uses beyond those mentioned above can be made of this instrument. As the serviceman becomes more familiar with his vacuum tube voltmeter he will find it of greater and greater help and will ultimately consider it to be one of the tools with which he cannot function properly.

Cathode ray tubes and oscillographs have found their place in the radio field and will continue to be of importance in receiver design and

(Continued on page 23)

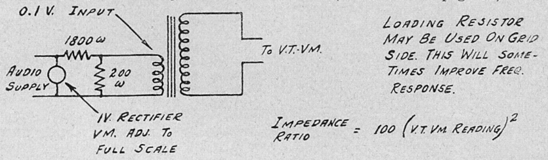


Figure 32

Recent Devolopments in Radio Telephony

By Ross F. Treharne, ex VK2IQ.

[This article is merely intended to draw attention to recent advances in Amateur Radio Telephony Technique, and to present briefly the principles involved. Two/one voice modulation, cathode modulation and frequency modulation are discussed. Reference to the original papers is recommended for more complete treatment of detail. The article constitutes notes of a lecture delivered before the New South Wales Division of the Institute in February.]

Amplitude Modulation.

In order to understand recent developments in amateur modulation technique, it is necessary to revise elementary definitions of modulation.

In the most commonly employed systems of Radio Communication, information is transmitted by varying the **amplitude** of the radiated waves. If we describe such a wave by means of a time-amplitude graph and then draw a curve through the peaks, and then the troughs, the **envelope**1 so described represents the modulating components, e.g., the audio, etc. In a wave of this type there are present, in addition to the carrier frequency **side band** frequencies2 consisting of the carrier plus and minus the modulating frequency components.

The degree of modulation, or **modulation factor,** for a sinoidal (sine wave) variation of amplitude can be expressed as:—

$$m = \frac{Eo - Emin}{Eo}$$

where m = modulation factor

Eo = average envelope amplitude

Emin = minimum envelope amplitude.

However, when the envelope is not sinoidal it may be necessary to define the modulation separately for peaks and for troughs.

Then, if mp and mn are the **positive** (peak) modulation and **negative** (trough) modulation factors respectively, we have

$$Mp = \frac{Emax - Eo}{Eo}$$

and

$$Mn = \frac{Emin - Eo}{Eo}$$

where Emax is the maximum envelope amplitude.

Further, an **average modulation** factor, ma, can be defined as:

$$Ma = \frac{1}{2}\,\frac{Emax - Emin}{Eo}$$

If the modulation factor is multiplied by 100 the product is called **percentage modulation.**

In order that the modulating components be capable of being reproduced without **distortion** the envelope should follow them closely. It follows then that the maximum percentage of modulation in the negative direction cannot exceed 100% without envelope distortion, since Emin 0 when mn 1.0. However, in the positive direction the percentage can exceed 100%, without distortion, under certain conditions.

The degree of modulation which can be accepted without envelope distortion is known as the **modulation capability** of the transmitter.

Under no circumstances should the modulation capability be excessively exceeded since the consequent harmonic distortion 3 of the envelope gives rise to high side bands.

Two/One Voice Modulation.

It has been found 4 that the wave form of the **average male voice,** when transmitted through an amplifier of limited bass response, has **a symetrical peaks** which are about twice as high in one direction as in the other. Now if the modulation percentage with such spech is limited to 100% in both directions, the mean percentage modulation cannot exceed 75%, since, when the 2E peak is modulating 100% the smaller (E) peak can only modulate 50%.

However, using a 2/1 voice it is

possible to achieve 150% mean modulation without exceeding the modulation capability, that is without distortion or additional interference. The modulation capability in the negative direction is primarily fixed by the carrier "cutting off" and is limited to 100%, but in the positive direction the modulation may be well above this without envelope distortion provided the amplifier is capable of the peaks. In this direction safe emission, grid drive, and plate loading primarily determine the modulation capability.

It is quite probable that many stations have unknowingly employed this method, as the requirements for such a plate modulated system are (a) that the polarity of the modulator leads be such that the larger peaks be in the positive modulation direction, and (b) that the modulated amplifier be capable of 200% positive modulation. The latter requirement would, no doubt, be fulfiled by many stations using unusually large tubes with low input and high grid drive. This may explain the often encountered remark that "A's modulation is much deper than B's yet both are using as much modulation as they dare."

An important feature of this system is that **heterodyne interference** is not increased yet the strength of the modulation is increased FOUR times approximately, or alternatively, for the same modulation strength the heterodyne is quartered.

Cathode Modulation.

Cathode modulation 5 is essentially a **combination** of **grid** bias and **plate** modulation, and combines some of the advantages of both.

Grid bias modulation is fundamentally an efficiency modulation system, that is the efficiency, and consequently the output of the amplifier is varied in accordance with the grid bias. For example, assume a peak efficiency of 80%, then the resting ,or carrier, efficiency cannot

exceed 40% if 100% sinoidal modulation is to be employed. But if only 70% modulation be required, the resting efficiency can be increased to 53% since less output swing is required. This results in 33% more carrier. Now if the amplifier be plate modulated a further 30% the signal will be 100% modulated. A rough calculation of the audio power required to do this gives 10% of the input and yet the efficiency is about 53%.

Normally the distortion 6 would be high due to the grid operating in the grid current region, but by loading the plate circuit heavily there is some cancellation of the distortion by the plate curvature.

With tubes of amplification factors between 15 and 25 introducing the modulating voltage into the **cathode** circuit gives about the correct swing to both plate and grid. In some cases it is necessary to use a tapped transformer to optain the optimum ratio.

The application of two/one voice modulation is readily obtained with considerable advantage.

Frequency Modulation.

If, instead of varying the amplitude, the **frequency** 7 of the wave is changed in accordance with the modulating signal, keeping the amplitude constant, we have frequency modulation. The extent or **range** of the frequency variation is made proportional to the modulationg signal, and the **rate of variation,** that is the number of times the frequency is changed betwen maximum and minimum per second gives the modulating frequency.

An analysis of a frequency modulated wave indicates the presence of many additional **side band frequencies.** When a carrier of frequency fo is modulated at a rate of fs, the resultant wave contains components, fo, fo fs, fo—fs, fo 2fs, fo—2fs, fo 3fs, fo—3fs, . . . etc. However, if the rate of frequency range variation to the audio frequency is made large the second order and higher components are small. It is general to employ a **band width** of 100 kc. when the audio range is 20,000 cps. This wide band width makes the use of UHF necessary.

Frequency modulation can be accomplished in many ways, the most elementary of which consists of an oscillator whose frequency is varied by means of a **mechanically** operated variable condenser. The moving plate is actuated as a loud speaker diaphragm is operated, giving capacity fluctuations which are transformed into radio frequency fluctuations, in the tank of the oscillator. More conveniently, an electrical variable reactance can be constructed by making use of the Miller Effect 8 in a tube. It can be shown that the effective **reactance 9 of a tube** can be made a function of the grid potential and if such reactance is shunted across the oscillator tank, and the grid voltage varied in accordance with the modulating signal, appropriate frequency modulation can be accomplished.

Armstrong's method 10 is a more complex system, and will not be treated here.

The **reception** of frequency modulated signals requires the use of special circuits.

(a) The signal is first collected and amplified in a more or less conventional antenna, rf, convertor and if channels with the exception that a wide **200 kcs channel** be employed in all circuits. This does not present difficulty since the response does not have to be flat as amplitude variations, within limits, do not effect the audio response.

(b) The frequency modulated intermediate frequency (1500 kcs., for example) is then passed through an amplifier operated near saturation point so that any large increase in signal is reduced in amplitude. In effect it tends to maintain a more constant level with consequent noise peak reduction.

(c) The signal is now converted into an amplitude modulated wave by means of a **discriminator**. The simplest form consists of a detuned i.f. transformer. Consider the signal applied to an i.f. transformer which is tuned to peak a little more than 100 kcs. higher than the mean frequency of the signal. The response through the transformer will be a function of the difference between the resonant frequency of the transformer and the instantaneous signal frequency. That is a frequency fluctuation produces an amplitude fluctuation. If the operting point on the transformer is suitably chosen this relation can be made linear.

(Continued on page 16)

Latest Hand-books Received

By VK3ML.

RADIOTRON DESIGNERS' HAND-BOOK—Third Edition.

Edited by F. Langford Smith (B.Sc., B.E., Member I.R.E. (U.S.A.), M.I.R.E. (Aust.), A.M.I.E.E (Aust.).

To produce a text book of 352 pages to cover all the phases of radio receiver and amplifier design in treatise form would undoubtedly be an impossibility. Such a feat could have been done many years ago, but, now each phase is a science of its own and requires its own authorities specialising in its own sphere. However, in a laboratory, workshop or design room, a condensed version of the major subjects likely to be handled is of extreme importance. The Radiotron Designers' Handbook has been publishd to meet this end, and we have had the pleasure of reviewing this very useful handbook compiled by Mr. Langford Smith, of the A.W. Valve Co. Pty. Ltd.

We could call the publication a "Radio Dictionary" or "Glossary of Radio Terms" in that it is a handbook covering a wide field, in a condensed form, of radio reproduction apparatus design data. Our review is from the Amateurs' point of view, and in it we find a wealth of handy technical information of value in planning the construction of ham receivers, etc. The sections are eight in number. Part I covers Audio Frequencies in 13 chapters, which handle amplifiers, power output stages and loudspeakers, biasing, fidelity, negative fedback, tone compensation, recording, decibels, etc., etc. Part II treats radio frequencies in 8 chapters with amplifiers, frequency conversion, detection, A.V.C. and A.F.C. amongst the subjects therein. Rectification, filtering and hum occupy all of Part III. The receiver components, such as transformers, voltage dividers and tuning indicators receive four chapters under Part IV. A subject usually little written about—Testing and measuring receiver performances — takes up Part V and is of special interest. Parts VI, VII and VIII with the remaining eight chapters cover valve characteristics, general theory and sundry data; whilst a comprehensive index is to be found at the back.

The foreword claims, "the information is arranged so that all those interested may derive some knowledge with the minimum effort in searching," and we would sincerely recom mend this 1940 publication to all keen hams as a member of the book shelf. (McGill's Agency, Elizabeth Street, Melbourne, price 3/-).

THE "RADIO" HANDBOOK.
(Sixth Edition).

Although amateur radio transmissions are at a standstill in Australia, the science is still marchnig on in neutral countries. The rapid advancements can well be followed by studying the latest "Radio" Handbook just received.

The sixth edition of this publication carries a total of 640 pages, including a comprehensive index and advertising catalogue. The editors claim a thorough revision over previous editions and not merely a bringing up-to-date. To keep abreast with rapid advancements in commercial equipment the majority of apparatus shown in the constructional sections is newly built for this edition. It is a vital importance that all this apparatus should be of proven performance, and we are assured that this is so. So many hams have been discouraged in the past by building "according to specifications" and finding that some gear fails to work to expectations. Some journals have left us with the impression that an odd article or two has obviously been written especially for the press with too scanty a try out beforehand. However, our experience of the past in actual construction work tells us that the technique and styles adopted by the "Radio" editors are pretty sound and, as a general ham "Bible," the "Radio" Handbook leaves little to be desired.

For those desirous of commencing the ham game and sitting for the A.O.P.C. there are several chapters

in the handbook devoted to elementary and advanced theory that make it highly suited as a textbook. The "Radio" Handbook has become universally known over Australia and neds no introduction to our readers. (McGills, Melb. price).

THE A.R.R.L. HANDBOOK.
1940 Edition.

The production of amateur radio handbooks since 1926 has given the A.R.R.L. an opportunity of learning by experience just what a publication of this nature should contain. Several fine technical editors have devoted much time to the set-up of the A.R.R.L. handbooks in the past and now, with George Grammer as the compiler-in-chief, the 1940 edition reflects the pains and efforts of previous workers.

Periodically, such a handbook requires a thorough combing and overhaul to permit modern theories, designs, and methods of presenting them to be set-up afresh. At the same time as being up-to-date the A.R.R.L. Handbook still carries the air of conservatism in each chapter giving one the feeling that the "meat" is solid and technically sound. This material can be relied upon and it is for this reason that the A.R.R.L. provides us with a more or less standard text book for A.O.P.C. seekers. However, as the Australian Amateur's ticket demands much deeper theoretical knowledge than given in such handbooks, we suggest to any such aspirants that they use these handbooks in conjunction with say the Admiralty Handbook.

A very welcome feature of the 1940 A.R.R.L. Handbook is the bibliography of articles in QST at the end of each chapter where one can find more extensive descriptions of certain apparatus. Going to 575 pages, the A.R.R.L. has covered the matters of general theory and construction in 32 chapters in a very clear form. The authors have imparted their knowledge in a very easy style and it is through this and the modernity of the handbook that we recommend the 1940 Radio Amateurs' Handbook to all hams, both young and old. (McGill's, Melb. price).

(Continued from page 13)

(d) The resultant amplitude modulated wave is then **detected** and amplified as usual.

The principal advantage of frequency modulation is the great reduction in static and man made noise. The receiver will respond to radio frequency modulation only and not to amplitude modulated waves of which noise mainly consists. Further, considerable improved fidelity of audio frequency response is available since, as shown above, the amplitude response of the tuner is not critical.

Foot Notes:

1. The equation to the wave envelope can be expressed as:
$y = Eo + E1 \sin (w1 + z1) + E2 \sin (w2 + z2) + \ldots$ etc.
where Eo is the average envelope amplitude and E1 E2 E3 . . w1 w2 w3 . . . and z1 z2 z3 . . . etc. are the amplitudes, frequencies and phases of the modulating components.

2. In general, each component of the envelope variation will give rise to two additional waves (side bands) of frequencies, Wc+W1, Wc—W1, Wc+W2, Wc—W2, Wc+W3, Wc—W3, . . . etc., where Wc is the carrier frequency.

3. Distortion of the envelope may introduce additional components of higher frequency giving rise to excessively remote side bands. For example, fourth harmonic distortion of a 5000 cps. modulating note would give rise to side bands 40 kcs. wide.

4. See Radio Dec. 39. p. 11.

5. See Frank C. Jons: Radio Oct. 39, and QST Nov. 39. Edmonds: QST Dec. 39. Dawley: Series Cath. Mod., Radio Dec. 39. Turney and

5. See Frank C. Jones: Radio Oct. 39. Operating Data.

6. See Terman "Radio Engineering."

7. See Radio, Jan. 40. Terman, loc. cit.

8. See Radiatron Designers' Handbook, chapt. 7.

9. See Phillips Tech. Com. No. 64. page 4.

10. See Radio, Jan. 36.

Federal and Victorian QSL Bureau

R. E. Jones, VK3RJ, QSL Manager.

G4AW, S. Garnett, Telegraphist on H.M.S. Hector, was a visitor to Melbourne during February. Unfortunately he missed seeing most of the boys, but his letter read at the February meeting of the Key section of the Victorian Division ensured him some mail. We hope to have more intimate contact with him on his return from ZL.

A member of the Australian Air Force, Tim Teehan, ZL2SK, was welcomed to the March meeting of the Key section of the Victorian Division. Other visitors—all in the popular blue uniform—to the February and March meetings were VK2 EAU ake ama ip tq 4cw 5rk and locals in 3dg 3yf and 3ys. Other interstaters at present incarcerated at Point Cook include VK2HY ams 3GW, 5HR, 5LK, 5ZZ.

W9VKF, L. A. Morrow, writing on January 9th, concludes "All of us W stations owe the Federal QSL Bureau and its manager a large debt of gratitude for the excellent way in which VK cards have been handled." Quite a thrill to get a letter of appreciation.

Pleased to hear from John Tutton, VK3ZC, who at the moment of writing was holding down one or two pips in a militia Artillery camp at Mt. Martha, Vic.

Also another one to bob up in the post was Robbie, VK3US, who is languishing at the Aeradio station, Canberra, and who hopes to strike more civilised spots in the near future.

Observations on 7mc during February/March revealed that phone stations at good strengths and owning good Aussie voices are occasionally to be heard. Truly the day of the pirate is not past.

Still a few oversea cards are straggling into the Bureau. Anyone who considers there may be one for him among these can ascertain definitely if he cares to write and include return postage.

The campaign sponsored in West Australia and directed towards all VK6 Federal Parliamentarians, and designed to bring plainly before their notice the claims of hams to have at least the ultra ultra high freqs allocated to them, during the time we are forbidden the use of lower freqs, is to be unleashed this month. These West Aust. chappies were good enough to postpone their campaign at the Institute's request, while more constitutional methods were tried. Now these have failed, go to it VK6, and more power to your elbow.

A welcome and interesting visitor in the shape of Syd. Maddern, VK6 MN was present in Melbourne in the early part of March. Syd., who fills out the attractive uniform of the R.A.A.F., was over on Air Board business.

Congratulations to the following hams, who were successful in passing the examination for transfer or appointment as Mechanic, Broadcasting (P.M.G.): Keith Heitsch, VK3HK; Tom Lelliott, VK3ZW; and Roy Buckerfield, VK5DA.

Short Wave and DX Section

SHORT WAVE AND DX NOTES.

We are publishing for the first time a new section, which we anticipate will prove of interest. This section introduces a new sphere of activity for hams, who are invited to submit their contributions of DX observations. It is hoped from the notes submitted that our readers will be able to obtain first hand comments, signal strengths and details of general short-wave conditions, which should prove of great assistance to all shortwave enthusiasts. Contributions are invited from Hams and SWL's of anything of interest heard during the month.

With enthusiastic support, this Section could easily become one of the most popular features of "Amateur Radio." We would also like to include call lists of stations heard on the Amateur Bands.

From observations made over the week ending 15/3/40, the following stations are on the air regularly:—

7.45 a.m.—2RO3, Rome, 31.13 m. Excellent volume and quality.

8 a.m.—WGEO, U.S.A. 31.48 m. Fair volume, otherwise clear.

VUM2, 25.32 m. 11.30 p.m. Very good volume.

VUD2, 31.28 m. 11.30 p.m. Very good volume.

VUM2 call is doubtful, but relays VUD2.

K2RM, 31.35 m., KGEI, 31.48 m., both coming in about midnight very well, and promise constant, good reception.

XGOY, 31.39 m., 12.30 a.m. Usually on 25.21 m. Female voice announced return to that wave length.

GSF, 19.82 and Saigon, 25.75 and KF6JEG, 20 m. are all excellent volume about midnight.

DJB, Germany, 19.74 m. Rather faint, midnight.

ZBW3, 31.49. Rather faint, midnight.

KZIB, 31.95 m. Good volume, midnight.

The following amateurs have been also heard: KF6JEG, K6BNR, PK3 GD,WIPKJ, WIGND, KAIRV, W2 GW and XU8ZA.

Static and fading, if any, was only slight over this period.

By J. F. Miller.

Divisional Notes

IMPORTANT.

To ensure insertion all copy must be in the hands of the Editor not later than the 18th of the month preceeding publication.

N.S.W. DIVISIONAL NOTES.

The January Meeting of the VK2 Division marked a milestone in the history of Institute in this State. Originally founded in New South Wales in 1910, the Institute gradually expanded until it became a Commonwealth wide organisation, with a Division in each State, and the New Guinea Amateur Radio League affiliated with the New South Wales Division. In 1922, the Division became an incorporated body, registered under the Companies Act of N.S.W., and it is interesting to note the names of the signatories to the Articles and Memorandum of Association. They were as follows: Charles Dansie Maclurcan, 2CM; John Herbert Pike, 2JP; Walter Renshaw, 2DE; Harry Stowe, 2CX; Malcolm Perry, John Wilson, and Charles Bartolomew. These were names in those days that were known throughout the amateur sphere, particularly Charles Maclurcan, 2CD.

From 1922 until 1932, the character of the Institute gradually changed, due mainly to the great progress that Radio was making in the Commercial sphere, so much so that from 1932 till 1935 it could not be regarded as an Amateur body. In 1935, through the courtesy of the Institution of Radio Engineers (Aust.), the Association of Radio Amateurs, who had been functioning in the interim as the Amateur body, were given permission to use the name Wireless Institute of Australia, New South Wales Division. This permission was obtained mainly by the efforts of the then President and Secretary, F. M. Goyen, 2UX, and R. H. W. Power, respectively. In 1937, the charter was handed back to the Amateurs, and since that time the Council has been carrying out certain formalities made necessary by present day requirements. The Divisional Vice-President, W. Ryan, VK2TI, has been the driving force in the Divisional Council's efforts to regain the charter, and it was fitting that he should be in the chair at this first meeting under the original charter.

VK2TI in his remarks, stated that Council were very gratified to know that their efforts had at last been rewarded ,and he felt sure that many of the older members of the Division shared this gratification. Unfortunately, the ban on transmissions marred the rejoicings, but members should realise that once hostilities cease, there will be a well organised and representative body ready to take up cudgels on behalf of the hams.

No ballot was necessary for the election of Council only seven nominations being received. They were as follows: Messrs. Ackling, Carruthers, Fraser, Goyen, Peterson, Ryan and Treharne. These members will be elected to their respective positions prior to the February meeting.

VK2RA, Ray Priddle, delivered a very interesting lecture on a subject somewhat removed from Radio. 2RA is a member of the leading firm of structural engineers in Sydney, and he chose for his subject "Some Considerations in the Design of a Modern skyscraper." Judging by the number of questions the Lecturer had to answer it is quite certain that his talk was one of the most interesting delivered.

An old timer present at this meeting was Arthur Simmonds, VK2GS, and he was given a hearty welcome by the Chairman.

A FEW PERSONAL PARS.

VK2AHM.—Jeff Whyte, of V beam fencing wire antenna fame, way out at Wentworth, feels lonely occasionally, so rings up Tubby Vale, 3MK, and has a qso per medium of the landline. Jeff is also a little peeved about the ban on transmissions as he was anxious to make the DXCC with his 6 watts input.

VK2TJ — Way up at Groote Eylandt is beginning to wonder what its like to feel cold. He reckons our heat waves would be classed as blizzards up at his qth. Roger would be pleased to hear from any of the lads. Qth. Aeroradio Station Flying Boat Base, Groote Eylandt.

VK2EO.—Dave, that old DX hound, is pounding brass "somewhere in Australia," and has some great ideas about his new rig when he gets back on the air, and would be pleased to hear from any of the gang. Correspondence should be addressed c/- Box 1734 JJ, G.P.O., Sydney.

VK2AFJ.—Several enquiries from the La Perouse district have been made regarding the whereabouts of John. Wonder why?

VK2RA.—Finding time heavy on his hands these days has decided to become engaged. All the best, Ray. One thing about it, you'll be able to bring your Qsl's up to date now. Hope all your troubles are little ones.

VK2PF.—Fred has been bitten by the high fidelity (?) bug. Invites the gang to high brow recitals of records. Enoying much better health these days. No doubt it's the amplifier.

VK2TI.—At a long last has received a card from Utah. Very pleased about it. Why?

It has been rumored that the R.A.A.F.W.R. had to order an outsize in parachutes for a certain very well known VK2.

VK2AJF.—John Field, way down in Deniliquin is complaining of the cool (?) weather, and is sympathising with the gang in V.I.S. they've only had three days with a temperature over a 100 degrees. John heard a K6 working KC4USC, the Snow Cruiser, and is anxious to get back on the air again.

N.S.W. DIVISIONAL NOTES.

The February General Meeting of the Institute was held as usual at Y.M.C.A. Buildings, Pitt Street, Sydney. The Chairman announced that Councillors — who had been elected unopposed — had now been appointed to their various offices. These were as follows:—

President: H. Peterson.
Vice-Presidents: F. Goyen and W. G. Ryan.
Secretary: C. Horne.
Treasurer: H. Ackling.
Publicity Officer: W. G. Ryan.
Technical Officer: R. Treharne.
Magazine Manager: R. Treharne.

The Meeting was informed that the Morse Code Classes had been reorganised, and that Messrs. Priddle and Ryan would in future be in charge on alternate Tuesday nights. Meeting was informed that it had been decided to fall in line with other bodies doing this work, and that a small charge wuold be made to each student. These classes are held every Tuesday night at Y.M.C.A. Buildings, Pitt Street, Sydney, and are open to all. A Beginners' class commences at 7 p.m., and Advanced class (10 words per minute and over) at 8 p.m. Further particulars may be obtained by ringing FX 3305.

It has been decided to present all Members going abroad with any of the Fighting Services with a letter of introduction, written in several languages, to the various National Societies that it is thought that they may possibly come in contact with.

Upon the conclusion of General Business, a very interesting and instructive lecture entitled "Cathode and Frequency Modulation," was delivered by the Technical Officer, Ross Treharne. In his talk, 2IQ gave ample evidence that he had made a deep study of this subject, and upon conclusion members showed their appreciation in no uncertain manner.

KEY SECTION NOTES.

By VK3CX.

The attendance at the March K.P.S. meeting was not as good as was expected, only 26 turning up, but amongst those were three distinguished visitors in the form of VK3YS, VK2TQ, and ZL2SK. One thing that this war has done is to bring to our meetings large numbers of hams from distant places, thus giving the locals a chance to see what the other men look like.

ZL2SK gave some very interesting information to a group of interested listeners about ham conditions in New Zealand, and although they are, or were, permitted to use 100 watts, I think we are much better off here in Australia with the multitudinous privileges which our Radio Department allows us.

Our "Ole Bill," not of better hole fame, but just famous as 3WG, was the main item on the programme, and after telling the boys how very close we were to receiving permission to transmit on 2½ metres—actually it was only a matter of the Admiralty say either "Yes" or "No," and they

happened to pick the wrong word — he proceeded to give us the low down on "Photo Electric Effect." A most interesting lecture, which was illustrated in no mean style by JO, whose motto is "We can't show all the pictures, so we only show the best." Bill's lecture was most favorably received, and those who didn't attend certainly missed something worth while.

RJ (the acting chairman) distributed some QSL cards. At one time he used to bring the QSL's to the meeting in a heavy suit case, but now he just pops them into his vest pocket. Strange as it may seem, he still suffers ham QRM, just ask him about it. He gave some interesting dope about a few misguided coots who are breaking their necks to get into one of the nice cells at the local Gaol, all through their idea that transmitters are meant to be used.

A monitoring scheme was inaugurated under which about a dozen of the boys are going to listen for one hour two nights each week and the results will appear in this month's magazine.

XS was recently reading a love story in which the conversation turned to a radio programme, and the heroine said that her reception of same was marred by dots and dashes from one of the local amateurs down the street. Must have been a prewar story.

FR is still trying to get his receiver to work so that he can hear all the rare DX, while IW spends some of his time listening to the DX that he would like to work. HK is still trying to locate an 1852 tube to finish off his new receiver—he hopes to have it finished by the time the war is over. IG says there is no truth in the rumor that his 90 feet tower has been loaned to the local birds to build their nests in. XJ doesn't know whether to be happy or sorry about the fact that the gang picked him out for a ham when he was 200 yards away. They said they knew him by his walk—guess its another case of too much keying with the left foot.

RX has not been seen his engagement was reported in the local papers, and ML apparently has not yet recovered from his honeymoon. QV has an excellent recipe for a concoction which he calls a "rum teaser"—next time you see him near a pub ask him about it and MAYBE he will invite you in to try it.

CX had an interesting letter from G4AW, who is on a warship in these waters. He hopes to be along to a meeting in the near future. CX has been doing a spot of listening, and has heard a few who caused his trigger finger to itch, amongst them were AC4YN at s7, HI3M, YV5ABY, and numerous CE, LU, PY, HH, J8, KH6 and KB6. Wont there be a rush for the key as soon as the ban is lifted.

The 15th of the month saw a very convivial gathering at one of the local pubs. HC, WG, OC, CX and a couple of others had gathered to help RX drown his sorrows in view of his forthcoming nuptials. After a highly successful dinner, the night was finished at the Tivoli Theatre. RX received a suitably engraved pewter pot and loads of good advice from the married men present.

Next month we are promised a lecture on "Audio Recording" complete with records and hot music. It should be worth while, so don't forget to turn up.

QUEENSLAND DIVISION.

By VK4LT.

The monthly meeting of the Queensland Division of the W.I.A. was held on Thursday, the 25th January, at Headquarters, Diggers' Assoc. Rooms, Adelaide Street.

About half a dozen of the usual Die Hards rolled up, regardless of the terrific heat which we have been subjected to for over 10 days past.

The dress worn would have suited a picnic party rather than a meeting of former famous hams. But we just had to keep cool.

Mr. A. Walz (VK4AW) presided.

The meeting got organised after Herb (VK4ES) arranged the fan to eveyone's satisfaction, about 8.15 p.m. Members present included: AW, RY, XO, KK, OK, ZU, ES, JF, KS, LT.

The chairman welcomed VK's 4OK, KK and XO, all country boys now in the Big Smoke.

After this was discussed, a Card Sorting Party took place, and the Boys received their few paltry Cards (luxuries).

The Technicians told us all about the Mystery German Station, and how it was worked. Better not mention names in case Adolf tries to contact them Hi' Hi'.

Then at 9.30 the heat drove the members to the newly found Refreshment House, and there the party told tales and cooled off till about 11 p.m., having had quite an enjoyable evening.

All members should note meetings are held on the last Thursday of each month at H.Q. Diggers' Rooms, Adelaide Street, opp. Anzac Park, so how about coming along and keep the gang together.

Any news regarding what some of you boys are doing now would be appreciated by the Scribe, and don't complain if the notes are short this time, as I have been out of circulation for three months.

VK4KS.—Keith now a member of the Australian Corp of Signals, and going into camp for three months. Be like old times, Keith, with a key to play with, but no Mikes Hi'.

VK4XO.—Mark in the City now before QSYing to VK2 for his further exams. Best of luck.

VK4OK.—Jack, the 8 Watt 'fone lad, from the Woolly West, on Service in the R.A.A.F. in Brisbane. Key Puncher.

VK4KK.—Also a Wire Op. in the R.A.A.F. at Brisbane with Jack.

VK4ES.—Herb now well married. Main past time is "guzzling" Ice Cream. Also VK4 Fan expert.

VK4CJ.—Member of the R.A.N. over in DX lands. After some old QSL, Cedric. Hi'.

VK4RF.—Fred also a member of R.A.N. in VK3 Depot at present.

VK4ZU.—Howard swatting up on Photography. Dearer hobby than Radio, boy.

VK4FB.—Fred now a first-class Grass Cutter. He spends his spare time motoring in his Baby Flea.

VK4LT.—Back in circulation after 13 weeks' Brass Pounding in a nearby Fortress. Trying hard to dig up notes to write for the Mag. So let's have any dope you have, Boys.

VK4SN.—Sa Frank, posted u a ltr before Xmas, but it's come home agn. Hrd u had shifted. Let's hve all the dope, OM.

VK4LT.—I'm making radio pay at last. Since back frm Camp, flat out fixing B.C. sets abt the district. Wud like to hr sum dpe frm country Hams.

VK4 DIVISION.

By VK4LT.

The Monthly Meeting of the Queensland Division (VK4) was held at H.Q. in Essex House, Adelaide Street, on Thursday night, 29th February officially, but owing to a certain member forgetting the key to the Room, the gang gathered in a nearby posh looking cafe, and it was here our Hon. Chairman, Mr. Arthur Walz, presided over a very enjoyable meeting.

Although the weather was damp, the hard-heads rolled along as usual. These included VK4's AW, RY, ZU, HR and Friend Eric, JF, ES, LT, XO, PX and UU.

Business was dealt with between milk drinks and Peach Melba Sundaes, Hi'.

Final arrangements were made for the Treasure Hunt to be held on March 9th, and all Members are to be at H.Q. on Sunday at 0930.

Then the burning question of the Annual Dinner was discussed, and it was decided to hold it on the second Friday in April, the 12th, at Atcherly House, this being subject to confirmation after our next Monthly Meeting.

All members are invited and we ask all to make a special effort to attend our next Monthly Meting, on Thursday, 28th March, to finalise matters.

Then, after Tibby, 4HR, and Eric had finished their big fat cigars, the bill was met by our prosperous Chairman, AW, and the meeting closed about 10.30 p.m.

Still looking for dope from you Country Hams, so what about slipping some along to this lad?

So don't forget the Dinner, gang, and don't forget to let us know who is coming.

VK4JF.—Jack never misses a meeting. Pity a few more like u OM.

VK4XO.—Mark vy interested in YL's Club Meeting, also held in our Select Cafe Meeting, Hi'.

VK4HR.—Tibby and his friend, Eric, smoked stagnant cigars during the meeting, much to the discomfort of members. Reckons he sold the Modulator to get 'em. Must had a lot of change. Hi'.

VK4JM.—Just hrd this poor chappie has now an XYL. Best luck, OM.

VK4JX.—Jack vy busy racing abt in his car, keeping B.C.L.'s satisfied.

VK4JB.—Oscar back in the sheep country. Wonder if he ever dreams of DX out there.

VK4GA.—Now has shifted to Westbrook I hr.

VK4JP.—George spending a holiday at Southport, then motoring south. Half ur luck this wx, OM.

VK4UR.—Jack, I hr is building an amp wid pr of pp 807's. Are u building a picture show to go wid em also, pal? Just think of the neighbours. Hi'.

VK4KS.—Keith pretty hot stuff wid rifle in camp. Ask XO.

VK4PX.—Arthur awaiting patiently fer WAC certificate. Also keen on sailing.

VK4RY.—Bill has another verified country, ES. Cards still cmg thru'. Still sees we get A.R. each month.

VK4MC.—Real talkie expert.

VK4KH.—Bill just listens and thinks wat he wud only do if———.

VK4FB.—Fred has plenty of "Time" on his hands to keep him gng. Hi'.

VK4AW.—Doesn't tell a bad yarn. Ask Herb.

VK4ZU.—Mac still keen on his Photography.

VK4FL.—Wat abt a visit next Meeting, Frank?

VK4UU.—Motor bike Bill still manages to balance our budget fer us.

VK4ES. — Herb spending time, money and worry (if possible) on his Baby—the Car.

VK4OK and KK.—These two lads still W/O's in R.A.A.F. in Brisbane at present. Gess cudnt wangle leave the last Meeting. Hope u both can wangle the Dinner OK.

VK4FY.—Believe to have gone to Camp.

VK4DM.—Another stranger. Hw abt a Meeting, Dave?

VK4TH.—Gess under water while writing these Notes. Here's hping all well, OM.

NOTES FROM MT. GAMBIER.

By 5CJ.

VK5TW is away in Adelaide on holidays at present. Tom has been instructing radio class in morse code and theory of radio.

VK5BN has ben called up in 21 years of age group and is stationed with the 3rd Light Horse Regiment at Mt. Gambier. Graham was very disappointed when war was declared as he had just finished a new rig and had 460 volt D.C. installed. The rig was never used.

I have been using my modulator equipment for P.A. work. At present I am getting the B.B.C. news in the evenings for local station. Twice weekly I have been taking a morse class at radio club. I have also found time to clean up the shack. Tell any of the hams at Laverton that they will always receive a warm welcome if they call in when they are over at the Mount on a flight.

—VK5CJ.

(Continued from page 10)

occasionally in test work. The cathode ray tube and vacuum tube voltmeter are similar in that neither instrument draws any appreciable current from the circuit to which it is connected. The oscillograph gives a picture of the wave form of voltage or current in the circuit under test. It does not, however, give any measure of amplitude and therefore comparative measurements are quite difficult to make with this type of equipment.

The vacuum tube voltmeter, on the other hand, reads potential or voltage drop across a resistor or condenser but will not give a picture of the wave form. As most of the measurements that the serviceman encounters are in connection with amplitude the vacuum tube voltmeter is in general of greater value than the oscillograph. Actually, when measurements of wave form are taken on an oscillograph there is not a great deal that the serviceman can do about altering that wave form. The single exception to this is that of flat topping intermediate frequency transformers in superheterodyne receivers. This particular procedure can be carried out with an oscillator and an output meter but of course a better picture of conditions is obtained with the oscillograph.

Other measurements on receivers can, of course, be made with the oscillograph showing pictures of the wave form at different points in the receiver, particularly in the audio circuit. However, when attempts are made to obtain readings of gain per stage, a.v.c. action, or oscillator r.f. potential, no accurate measurements in volts can be taken. In addition, the vacuum tube voltmeter will read d.c. potential directly in volts whereas on the oscillograph a shift in position of the axis will be the only visible effect.

With these facts in mind it appears that the oscillograph and the vacuum tube voltmeter will run concurrently in service work, but to the average serviceman it is felt that a great deal more use can be made of the vacuum tube voltmeter, as most of the measurements are in volts, either r.f., a.f., or a.v.c.

FINISH.

Correspondence Section

Torquay, Vic.,
Feb. 1, 1940.

Dear Sir,

I am enclosing an interesting extract from the T. and R. Bulletin, connected with the new Regulations in England.

"Extract from Defence Regulations, 1939."

"In pursuance of the powers conferred upon him by the Defence Regulations 1939, the Postmaster General has issued an order prohibiting the acquisition or supply of wireless transmitters and certain other electrical apparatus except under the authority of a Post Office Permit.

"Applications for permits should be made on special forms which can be obtained from any Head Post Office.

"The following is an extract from the order: 'No person shall, except under the authority of a permit granted by the P.M.G. for the purpose, sell, purchase, let, hire, supply, dispose of, acquire or distribute any of the undermentioned articles:—

'(a) Wireless transmitters which are designed to be used or are capable of being used for communicating by wireless telegraphy, wireless telephony or wireless television or for the purpose of indicating position or direction (such as navigational beacons or landing beacons) or for the purpose of the remote control of machinery.

'(b) The following articles intended for use as parts of wireless transmitters, namely, high frequency inductors, spark coils, quenched and rotary spark gaps.

'(c) Any wireless receiving apparatus which is designed to be used also as a wireless transmitter or which can be adapted for the purpose of being used as a wireless transmitter by the operation of a switch or by the charging of screwed or plug connections.

'(d) Line carrier telegraph equipment or line carrier telephone equipment.

'(e) High frequency equipment (being equipment which generates or uses high frequency current at frequencies greater than 10,000 cycles per second and having a maximum output exceeding 10 watts) including such quipment intended for use in connection with furnaces and medical apparatus.

(f) Electronic valves capable of an anode dissipation exceeding 10 watts.

'(g) Piezo electric quartz plates or piezo electric tourmaline plates cut to oscillate at any specified frequency.' "

VK5RN.

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5 Waimea Street,
BURWOOD, N.S.W.,
9/3/'40.

The Editor,
"Amateur Radio,"

Dear Sir,

I would like to draw attention to certain inaccuracies in the article "Resistance Coupled Amplifiers" of "Amateur Radio," December, 1939. On page 11, in the formula (eqn. 2) giving the ratio of amplification at high frequencies to amplification at medium frequencies (r_h), the term $\frac{R_a}{X_{cs}}$ should appear SQUARED, that is—

$$r_h = \frac{1}{\sqrt{1 + \left(\frac{R_a}{X_{cs}}\right)^2}}$$

Similarly in equation 3.,

$$r_l = \frac{1}{\sqrt{1 + \left(\frac{X_{cc}}{R_b}\right)^2}}$$

where r_l is the ratio of amplification at low frequencies to the amplification at medium frequencies.

Further, in equation 1.,

$$X_c = \frac{1}{2 \pi f C}$$

where X_c is the capacitive reactance in ohms of a condenser of C farads, at a frequency of f cycles per second.

Yours sincerely,

Ross F. Treharne, VK2IQ.

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